REMARKS AND DISCUSSION

Upon entry of the present Amendment-B, claims 1-4, 7-9 and 11-24 remain pending in the application, of which claims 1-4, 9, 15, and 17-19 are each independent, and of which claims 1-4, 7, 8, and 17-23 are withdrawn from considerations as being directed to non-elected inventions. New claim 24 is directed to the elected group/invention V as previously defined by the Examiner.

Amendments Presented

In the Abstract a redundant, unnecessary occurrence of "from", which was inadvertently added in Preliminary Amendment-A, is deleted

***In the Claims*:** Independent claim 9 has been amended to further define that :

The coating agent *consists essentially of* a powder of a substance containing said element to be diffused, a reducing agent for reducing an oxide film formed on said surface of said base material, and a solvent in which said powder of said substance and said reducing agent are dispersed or dissolved; the element *is diffused into the base material to a depth of not less than 0.5 mm from the surface* in the diffusing step; the diffusing step causes the concentration of said element to be gradually decreased from said surface to inside of said base material *such that an interface is not formed between the base metal material and the diffusion layer*; and *the surface of the base metal material having the element diffused therein is exposed outwardly after said diffusion step.*

Claim 15 has been amended to more clearly / definitely indicate that the second powder is coated on the base material having the first powder previously coated on at least a part of the base material, and has been further amended by being rewritten in independent form including all the limitations of claim 1 from which it formerly depended.

Claim 16 is amended by changing "selected from" to ---of---.

New claim 24 depends from claim 9 and further defines that the reducing agent is decomposed by the heating in said diffusing step, and a product of decomposition causes the oxide film on the surface of the base material to disappear by reduction so that the element is diffused into the base material.

Applicant respectfully submits that the above amendments are fully supported by the original disclosure, including the drawings, specification and claims. For example, applicant notes: the discussion at paragraphs [0047], [0075], [0082] of the published application which explain that no interface is formed between the base metal material and the diffusion layer; the discussion at paragraph [0069] of the published application which explains that the a product of decomposition of the reducing agent causes the oxide film on the surface of the base material to disappear by reduction so that the element is diffused into the base material; and the drawings which show that the die surface layer in which the element has been diffused is exposed outwardly (in other words, there is not another layer or coating on top of the surface layer). Applicant also respectfully submits that no new matter is introduced into the application by the above amendments because the entire subject matter thereof was expressly or inherently disclosed in the original claims, specification and drawings.

The above amendment to claim 15 is believed to directly overcome the Examiner's rejection of this claim under 35 USC 112, second paragraph, and it is respectfully requested that the rejection be reconsidered and withdrawn.

Allowable Subject Matter

Applicant gratefully acknowledges the Examiner's indication at item 9 of the Office Action that claim 15 contains allowable subject matter. Applicant has rewritten claim 15 in independent form pursuant to the Examiner's suggestion, and it is believed that this claim is now

in allowable form.

Response to Office Action

The above-identified Office Action has been reviewed, the references carefully considered, and the Examiner's comments carefully weighed. In view thereof, the present Amendment is submitted. It is contended that by the present amendment, all bases of rejection set forth in the Office Action have been traversed and overcome. Accordingly, reconsideration and withdrawal of the rejection is respectfully requested.

Objections

The Examiner has objected to certain language in the abstract and in claim 16.

Applicant's Response

While applicant understands with the Examiner's objections to the abstract, applicant has previously modified the language to which the Examiner objects in Preliminary Amendment-A. The above further amendment to the abstract corrects an inadvertent error introduced in the Preliminary Amendment-A.

Relative to claim 16, applicant has not introduced the term ---metal--- as suggested by the Examiner because it is believed that the present language is accurate and appropriate, whereas if the term ---metal--- is added this may lead to an unintended interpretation, e.g., only pure metal is added. As discussed in the specification, the Ni, Sn, and/or Cu may be added not only in the form of pure metal, but also as an alloyed metal.

Based on the foregoing, it is believed that the Examiner's objections are overcome and it is respectfully requested that the objections be reconsidered and withdrawn.

Rejection Under 35 USC 103

At item 8 of the Office Action, claims 9, 11-14, and 16 are under 35 USC §103(a) based

on Cottone (US Patent 5,549,927). It is the Examiner's opinion that Cottone's substrate surface modification method expressly or inherently meets all of the features of claims 9, 11-14 and 16. As disclosed, Cottone's method involves application to the surface of a mixture of ceramic powder, flux, (optional) metal brazing powder, (optional) binder for reducing oxides on the substrate surface, and a solvent, and subsequently heating the mixture for a short time (e.g., 2 minutes or less) so as to metallurgically / mechanically bond the ceramic powder to the surface.

Applicant's Response

Upon careful consideration and in light of the above amendments to claim 9, applicant respectfully submits that the rejection is overcome and that the present claims patentably distinguish over the Cottone reference, because Cottone's disclosed surface modification process is fundamentally different from the present invention, as disclosed and claimed, and does not include or suggest features required by each of the rejected claims.

Initially, applicant respectfully submits that Cottone's surface treatment method is *fundamentally distinct* from the claimed invention. Cottone's method essentially involves a "topographical modification bonded to the substrate surface", e.g., ceramic powder is bonded to the substrate surface metallurgically or mechanically using flux and a brazing material (which is either added as a component of the mixture or is a braze clad pre-formed on the substrate surface). Such method involves a relatively short heat treatment, e.g., "about 2 minutes or less", which is "... effective to remove the binder, activate the flux and at least partially melt the braze cladding or the metal brazing powder", after which the heat treatment is terminated and "The surface is permitted to cool (box 28) to solidify the melt which results in the ceramic powder being bonded to the surface."

Conversely, the claimed invention essentially involves diffusion of an element relatively

deeply into the surface of the base metal material by applying a coating agent of the element and (optionally) a reducing agent to the surface and then gradually heating the coated base metal material over a relatively long period of time, e.g., 30 minutes once the desired heating temperature is achieved, permitting the diffusion to the relatively large depth of at least 0.5mm.

Applicant respectfully submits that any diffusion which may occur during Cottone's short brazing treatment is incidental and minor, and will not inherently result in diffusion of a element into the surface of a metal base material to a depth of not less than 0.5 mm and other associated features of the rejected claims. Moreover, applicant respectfully submits that Cottone's brazing method, including any incidental diffusion occurring therein, does not make obvious the claimed invention because diffusion is not a significant aspect of Cottone's method and he does not provide any reason or motivation for extending the length of his brazing treatment to achieve such a large diffusion depth as required by the present claims.

In this regard, the Examiner makes several allegations regarding characteristics and "inherent" results of Cottone's method, but applicant respectfully submits that such allegations are not supported by Cottone's actual disclosure.

For example, at the top of page 4 the Examiner alleges that, "The reference explicitly teaches a thermal treatment to cause reaction and formation of a coating; while "diffusion" per se is not cited, given the similarity of the scope of the claims and the reference, it would have been apparent to one of ordinary skill in the art that diffusion would have occurred *given sufficient time* (emphasis added)." Applicant respectfully traverses such allegation because it is not based on any suggestion or motivation which may be fairly attributed to Cottone's actual disclosure, nor is it based on any other appropriate rationale under 35 USC 103. Again, there is no similarity between the scope of the claimed invention, which expressly requires diffusion of an

element into a metal base material to a depth of not less than 0.5 mm, and Cottone's method which primarily involve metallurgically or mechanically bonding a ceramic powder to a substrate surface using flux and brazing material and a relatively short heat treatment, e.g., 2 minutes or less. On the other hand, the reference provides no motivation for use of a heat treatment of "sufficient time" to cause diffusion to the depth claimed, but instead *teaches away from use of long heat treatments*. Cottone specifically teaches away from lengthy and high temperature heat treatment to avoid "potential difficulties in surface modification of a substrate …." Instead, he advocates only a short heat treatment of 2 minutes or less because this is sufficient to at least partly melt the flux and brazing material such that when it is subsequently cooled it will bond the ceramic powder to the substrate surface. Based on Cottone's actual disclosure there is no reason to extend his brazing treatment for a "sufficient time" to cause diffusion to a depth of at least 0.5mm as asserted by the Examiner. The only basis for such a proposed modification is impermissible hindsight gained exclusively from applicant's disclosure.

Similarly, applicant respectfully traverses the Examiner's allegations regarding the degree, kinetics, and depth of diffusion being known as matters of time and temperature, and " … the specific degree of claim 9 [not less than 0.5 mm] an obvious variation, determinable by routine experimentation and/or end-use application" because: (again) Cottone provides no motivation or reason for the proposed modification, given that he specifically seeks to bond a ceramic coating to the substrate surface at a conventional time / temperature for brazing (, e.g., 2 minutes or less), whereas he is not concerned with diffusion of an element into the substrate surface. In this regard, Cottone never indicates or remotely suggests that time / temperature for diffusion of an element into the substrate surface is a result-oriented variable of his method, such that there is no reason to determine an optimum diffusion time or temperature for Cottone's

method under the guidelines of 3 5USC 103. The primary disclosed use for Cottone's surface-treated substrate is as a heat exchanger where the ceramic powder coating can significantly enhance hydrophilicity – which (again) has nothing to do with any element being diffused into his substrate surface; etc.

Regarding the dependent claims, applicant further submits that Cottone fails to disclose or make obvious the additional features set forth in the dependent claims. Regarding claim 13, for example, Cottone does not disclose or in any way suggest a heat treatment in which a *temperature gradient is formed in a diffusing step*. Again, given the very short times involved with brazing, and as expressly advocated by Cottone, e.g., 2 minutes or less, there is no reason for to (somehow) establish a temperature gradient in Cottone's brazing process.

Although applicant does not believe that the Examiner has established prima facie obviousness of any of 9, 11-14, and 16 based on the Cottone reference, applicant has amended independent claim 9 in an effort to expedite prosecution and allowance of the application.

Again, claim 9 is amended to define that the coating agent consists essentially of a powder of a substance containing said element to be diffused, a reducing agent for reducing an oxide film formed on said surface of said base material, and a solvent in which said powder of said substance and said reducing agent are dispersed or dissolved, and that the surface of the base metal material having the element diffused therein is exposed outwardly after said diffusion step. Such features are not taught or suggested by Cottone whose method involves a mixture primarily including a ceramic powder which is bonded to the surface of the base material through brazing. Further claim 9 also expressly defines that the element *is diffused into the base material to a depth of not less than 0.5 mm from the surface* in the diffusing step, and that the diffusing step causes the concentration of said element to be gradually decreased from said surface to inside of said base material *such that an interface is not formed between the base metal material and the diffusion layer*.

These are advantages characteristics and are in no way achieved or suggested by Cottone.

Other Matters

New claim 24 is believed to be allowable based on the foregoing arguments concerning claim 9, as well as on the merits of the additional features recited in the new claim.

CONCLUSION

Based on all of the foregoing, applicant respectfully submits that all of the rejections set forth in the Office Action are overcome, and that as presently amended, all of the pending claims are believed to be allowable over all of the references of record, whether considered singly or in combination. The applicant requests reconsideration and withdrawal of the rejection of record, and allowance of the pending claims. The application is now believed to be in condition for allowance and a notice to this effect is earnestly solicited.

Applicant respectfully requests that, if the Examiner has any questions / concerns relating to the patentability of the presently claimed invention over the references of record, then the Examiner telephonically contact applicant's undersigned representative to expeditiously resolve prosecution of the application which has been pending for approximately six years.

Favorable consideration is respectfully requested.

Respectfully submitted,

/ /

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